I. C. 7103

FEBRUARY 1940

UNITED STATES
DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES
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FATALITIES AT INDIANA COAL MINES, 1934-38

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

FATALITIES AT INDIANA COAL MINES, 1934-38[1]

By W. H. Tomlinson[2]

During the 5 years ended December 31, 1938, 188 fatalities resulted from preventable accidents in and around the coal mines of Indiana; 173 of these occurred at underground mines and 15 at stripping or open-cut operations. In addition, there may have been other unrecorded fatalities during this period. The two organizations receiving notice of accidental deaths at coal mines in this State are the Division of Mines and Mining and the Indiana Industrial Commission. Only deaths occurring at underground mines employing 10 or more men are reported to the former, as neither strip mines nor underground mines employing fewer than 10 men come within the purview of the Indiana mining law. The mine inspectors have no jurisdiction over this latter group of mines and do not inspect them. Fatalities at small "wagon" mines and open-cut operations are supposed to be reported to the Industrial Commission; however, in many instances deaths at small mines are not reported, the only record being a death certificate filed with the county or corporation health officer. Thus, many deaths in small mines escape attention, especially when the victim succumbs some time after the injury was received. The data presented here on fatalities in Indiana during the past 5 years include several instances in which the only record available is a death certificate; possibly others have been overlooked.

From 1934 to 1937 the fatality record was progressively worse, that of the larger underground mines in 1937 being more than twice the average for these mines for the previous 4 years and only slightly less than twice the average for all mines, including open-cut operations. The increase in deaths during 1937 was due to two explosions, with 20 fatalities in one and 2 in the other. The number of deaths in the larger underground mines was considerably less in 1938 than in the previous 4 years, but there was no improvement in the number of fatalities at the small mines or at open-cut mines.

Table 1 gives the number killed at all mines during the period 1934-38.

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7103."

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TABLE 1. - Fatalities at all Indiana mines, 1934-38

Year	Mines employing		Total fatalities		
	10 or more men	Fewer than 10 men	Underground mines	Stripping or open-cut mines	All mines
1934.....	13	1/ 8	21	4	25
1935.....	26	9	35	3	38
1936.....	27	7	34	2	36
1937.....	50	10	60	2	62
1938.....	13	10	23	4	27
Total...	129	44	173	15	188

1/ Includes 2 fatalities heretofore unreported that occurred before 1934.

The mining law of Indiana is designed to promote the health and safety of persons employed in and about the mines and to preserve and protect mine property. The present law does not apply to small wagon mines employing fewer than 10 men; consequently, numerous dangerous practices are followed that result in needless sacrifice of human life. Of the total number of fatalities at underground mines during the period covered by this paper 8 of 21 (38 percent) in 1934, 9 of 35 (26 percent) in 1935, 7 of 34 (21 perce in 1936, 10 of 60 (17 percent) in 1937, and 10 of 23 (43.5 percent) in 193 occurred at these small mines (table 3).

During the last 3 months of 1932 and the calendar year 1933 3/ approximately 42 and 43 percent, respectively, of all deaths at underground coal mines in Indiana occurred at these small mines. From January to April 193 (4 months) five fatalities occurred in the small mines, compared with seve in the larger mines.

The significance of the high fatality rate in small wagon mines in Indiana is not realized fully until it is compared with that of the mines which the present law applies. Data are not available on the number of me employed in these small mines, but it is known to be insignificant compare with the number employed in the larger mines. Furthermore, most if not al of these small mines operate during the winter only. A comparison based o exposure would show that the fatality rate of the small mines is much high than that of the larger mines. The Indiana Division of Mines and Mining estimates 3/ that the death rate per ton of coal mined during 1933 was abou times as great in the mines employing fewer than 10 men as in the larger m On a man-hour-exposure basis the comparison would be still more unfavorabl to the small mines. In addition to the great loss of life in the small mi the dependents of those killed as a rule are left without means of support and become subjects of public charity, as very few of the small-mine opera carry compensation insurance and usually they are in such a precarious financial condition that recourse to the courts by the dependents would be futile.

3/ Herbert, C. A., A Review of Coal-Mine Fatalities in Indiana During the Last 3 Months of 1932 and the Calendar Year 1933: Bureau of Mines Inf Circ. 6828, 1935, 22 pp.

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Undoubtedly these small mines should be subject to the supervision and control of the State inspection department; otherwise a material decrease cannot be expected in the present sacrifice of life in the coal mines of Indiana. An amendment designed to accomplish this purpose was introduced in the last State legislature, but unfortunately it failed to pass.

ACKNOWLEDGMENT

Through the courtesy of A. G. Wilson, chief, Division of Mines and Mining, his successor, Fred Ferguson, and the various deputy mine inspectors, accident reports were reviewed and the data condensed for recording here. Information on mine fatalities reported to the Indiana Industrial Board was obtained through the kindness of its employees. Valuable information was obtained from representatives of the Bituminous Casualty Corporation and the Lynch Coal Operators Reciprocal Association, two major companies carrying coal-mine compensation insurance in Indiana. Stanley Stohr, attorney-at-law, furnished data regarding injuries, especially those that occurred in small mines and those in which the victims died some time after the injury was received. Many of the data in connection with deaths at small mines were obtained through personal investigation and contact with various officials and employees at mines where accidents occurred.

Fatalities in Indiana coal mines during the calendar years 1934-38 are listed in tables 2 to 6. Table 2 lists the fatalities by location, table 3 by type of mine, and tables 4 and 5 by cause and occupation. Death statistics for the small mines employing fewer than 10 men are separated from those for the larger mines to emphasize the high fatality rate at mines outside the jurisdiction of the State inspection department.

Table 6 lists fatalities at stripping or open-cut mines by cause and occupation.

At mines employing 10 or more men, all fatalities in 1934, 92 percent in 1935, 96 percent in 1936, 94 percent in 1937, and 100 percent in 1938 occurred underground (see table 2). In 1935, 8 percent of all fatalities at these mines occurred on the surface and none in shafts. During 1936 no fatalities occurred on the surface and only one in a shaft. Two were killed on the surface during 1937 and one in a shaft.

The record of the small mines presents a different picture. Three of the eight fatalities in 1934 occurred in shafts and one on the surface; two men were killed in shaft accidents in 1935 and one each year from 1936 to 1938. There were no fatalities on the surface during 1938. The comparatively large number of shaft accidents at mines employing fewer than 10 men indicates the absence of ordinary safety devices and precautions in effect at the larger mines. The death ratio between large and small mines is shown clearly in table 3. Of all fatalities at both large and small mines, 38 percent in 1934, 26 percent in 1935, 21 percent in 1936, 17 percent in 1937, and 43.5 percent in 1938 occurred at the latter. Table 3 also lists the deaths at open-cut mines for the 5-year period 1934-1938.

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TABLE 2. - Fatalities at underground coal mines of Indiana, calendar years 1934-38, by location

	1934				1935				1936			
	Surface	Shaft	Underground	Total	Surface	Shaft	Underground	Total	Surface	Shaft	Underground	Tot
Mines employing 10 or more men:												
Fatalities.	-	-	13	13	2	-	24	26	-	1	26	
Percentage.	-	-	100	100	8	-	92	100	-	4	96	1
Mines employing fewer than 10 men:												
Fatalities.	1/1	3	1/4	8	-	2	7	9	-	1	6	
Percentage.	12.5	37.5	50	100	-	22	78	100	-	14	86	

	1937				1938				Tot
	Surface	Shaft	Underground	Total	Surface	Shaft	Underground	Total	193 193
Mines employing 10 or more men:									
Fatalities.....	2	1	47	50	-	-	13	13	1
Percentage.....	4	2	94	100	-	-	100	100	
Mines employing fewer than 10 men:									
Fatalities.....	-	1	9	10	-	1	9	10	
Percentage.....	-	10	90	100	-	10	90	100	

1/ Includes 2 fatalities heretofore unreported that occurred before 1934.

TABLE 3. - Fatalities at underground coal mines of Indiana, calendar years 1934-38, by type of mine

	1934	1935	1936	1937	1938	Total
Fatalities at mines employing 10 or more men.....	13	26	27	50	13	129
Fatalities at mines employing fewer than 10 men.....	1/8	9	7	10	10	4
Total fatalities at all underground mines.....	21	35	34	60	23	17
Fatalities at stripping or open-cut mines.	4	3	2	2	4	1
Total fatalities at all mines.....	25	38	36	62	26	187
Percentage of total fatalities at underground mines:						
Mines employing 10 or more men.....	62	74	79	83	56.5	
Mines employing fewer than 10 men....	38	26	21	17	43.5	
Total.....	100	100	100	100	100	

1/ Includes 2 fatalities heretofore unreported that occurred before 1934.

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TABLE 4. - Fatalities at underground coal mines of Indiana, calendar years 1934-38, by causes

	1934				1935			
	Mines employing -		Total	Percent of total	Mines employing -		Total	Percent of total
	10 or more men	Fewer than 10 men			10 or more men	Fewer than 10 men		
Underground:								
Falls of roof.....	4	1/ 4	8	37	15	6	21	60
Falls of coal.....	-	-	-	-	1	-	1	3
Explosions (gas ignitions).....	1	-	1	5	1	-	1	3
Haulage (mine cars and locomotives.....	4	-	4	21	5	-	5	14
Electricity.....	4	-	4	21	-	-	-	-
Explosives.....	-	-	-	-	2	-	2	6
Machinery.....	-	-	-	-	-	-	-	-
Suffocation.....	-	-	-	-	-	1	1	3
Lifting.....	-	-	-	-	-	-	-	-
Fires.....	-	-	-	-	-	-	-	-
Shaft:								
Persons falling down shaft.....	-	2	2	11	-	1	1	3
Cage falling on man in sump.....	-	-	-	-	-	1	1	3
Car falling on cage..	-	1	1	5	-	-	-	-
Surface:								
Machinery.....	-	1	1	-	-	-	-	-
Fall of loading boom.	-	1/ 1	1	-	1	-	1	3
Mine supply cars.....	-	-	-	-	1	-	1	2
Railroad cars.....	-	-	-	-	-	-	-	-
Total.....	13	8	21	100	26	9	35	100
Percentage.....	62	38	100		74	16	100	

1/ Includes 2 fatalities heretofore unreported that occurred before 1934.

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TABLE 4. - Fatalities at underground coal mines of Indiana, calendar years 1934-38, by causes (Cont'd)

	1936				1937			
	Mines employing -		Total	Percent of total	Mines employing -		Total	Percent of total
	10 or more men	Fewer than 10 men			10 or more men	Fewer than 10 men		
Underground:								
Falls of roof.....	12	1	13	38	16	7	23	
Falls of coal.....	1	-	1	2	2	1	3	
Explosions (gas ignitions).....	2	-	2	6	22	-	22	
Haulage (mine cars and locomotives.....	6	1	7	21	5	-	5	
Electricity.....	3	-	3	9	1	-	1	
Explosives.....	-	4	4	12	-	-	-	
Machinery.....	1	-	-	3	1	-	1	
Suffocation.....	-	-	-	-	-	1	1	
Lifting.....	1	-	1	3	-	-	-	
Fires.....	-	-	-	-	-	-	-	
Shaft:								
Persons falling down shaft.....	1	1	2	6	1	1	2	
Cage falling on man in sump.....	-	-	-	-	-	-	-	
Car falling on cage..	-	-	-	-	-	-	-	
Surface:								
Machinery.....	-	-	-	-	-	-	-	
Fall of loading boom.	-	-	-	-	-	-	-	
Mine supply cars.....	-	-	-	-	-	-	-	
Railroad cars.....	-	-	-	-	2	-	2	
Total.....	27	7	34	100	50	10	60	1
Percentage.....	79	21	100		83	17	100	

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TABLE 4. - Fatalities at underground coal mines of Indiana, calendar years 1934-38, by causes (Cont'd)

	1938				Total, 1934-1938
	Mines employing -		Total	Percent of total	
	10 or more men	Fewer than 10 men			
Underground:					
Falls of roof	6	8	14	61	79
Falls of coal	-	-	-	-	5
Explosions (gas ignitions)	-	-	-	-	26
Haulage (mine cars and locomotives)	5	-	5	22	26
Electricity	-	-	-	-	8
Explosives	1	-	1	4.3	7
Machinery	-	1	1	4.3	3
Suffocation	-	-	-	-	2
Lifting	-	-	-	-	1
Fires	1	-	1	4.3	1
Shaft:					
Persons falling down shaft	-	1	1	4.3	8
Cage falling on man in sump	-	-	-	-	1
Car falling on cage	-	-	-	-	1
Surface:					
Machinery	-	-	-	-	1
Fall of loading boom	-	-	-	-	1
Mine supply cars	-	-	-	-	1
Railroad cars	-	-	-	-	2
Total	13	10	23	100	173
Percentage	56.5	43.5	100		

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TABLE 5. - Fatalities at underground coal mines of Indiana, calendar years 1934-38, by occupations

	1934				1935				1936			
	Mines employing -		Total	Percent of total	Mines employing -		Total	Percent of total	Mines employing -		Total	Percent of total
	10 or more men	Fewer than 10 men			10 or more men	Fewer than 10 men			10 or more men	Fewer than 10 men		
Underground:												
Miners (including owners of small mines)	5	1/ 6	11	53	3	6	9	26	2	5	7	20
Timbermen	-	-	-	-	3	-	3	8	4	-	4	12
Motormen	1	-	1	5	1	-	1	3	6	-	6	17
Brakemen (tripriders)	3	-	3	16	1	-	1	3	2	-	2	6
Officials	-	-	-	-	3	-	3	9	2	-	2	6
Cutting-machine:												
Operators	-	-	-	-	3	-	3	9	3	-	3	9
Helpers	1	-	1	5	-	-	-	-	2	-	2	6
Loading-machine:												
Operators	-	-	-	-	1	-	1	2	1	-	1	3
Helpers	-	-	-	-	1	-	1	3	2	-	2	6
Others	-	-	-	-	2	-	2	6	-	-	-	-
Laborers (jerrymen)	2	-	2	11	-	-	-	-	-	-	-	-
Trackmen	-	-	-	-	2	-	2	5	1	-	1	3
Drivers	1	-	1	5	-	-	-	-	-	1	1	3
Pumpers	-	-	-	-	1	1	2	5	-	-	-	-
Bratticemen	-	-	-	-	1	-	1	3	-	-	-	-
Drillers	-	-	-	-	-	-	-	-	1	-	1	3
Cagers	-	1	1	5	-	-	-	-	-	-	-	-
Engineers (hoisting)	-	-	-	-	-	-	-	-	-	-	-	-
Shotfirers	-	-	-	-	1	-	1	3	-	-	-	-
Electricians	-	-	-	-	1	-	1	3	-	-	-	-
Couplers	-	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	2/ 2	2	6	1	1	2	6
Surface:												
Car droppers	-	1	1	-	1	-	1	3	-	-	-	-
Laborers	-	-	-	-	1	-	1	3	-	-	-	-
Total	13	8	21	100	26	9	35	100	27	7	34	100
Percentage	62	38	100		74	26	100		79	21	100	

1/ Includes 2 fatalities heretofore unreported that occurred before 1934.
2/ 1 was a member of a party of 4 unauthorized persons exploring an abandoned small mine; the other was a [illegible] who entered the mine with a friend to keep him company.

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9 - Fatalities at underground coal mines of Indiana, calendar years 1934-38, by occupations (Cont'd)

	1937				1938				
	Mines employing -		Total	Percent of total	Mines employing -		Total	Percent of total	Total, 1934-1938
	10 or more men	Fewer than 10 men			10 or more men	Fewer than 10 men			
Underground:									
Miners (including owners of small mines)	3	9	12	19	2	7	9	39.0	48
Timbermen	10	-	10	17	3	-	3	13.0	20
Motormen	5	-	5	8	-	-	-	-	13
Brakemen (tripriders)	4	-	4	7	-	-	-	-	10
Officials	5	-	5	8	3	-	3	13.0	13
Cutting-machine:									
Operators	2	-	2	3	-	1	1	4.4	9
Helpers	1	-	1	2	-	-	-	-	4
Loading-machine:									
Operators	3	-	3	5	1	-	1	4.4	6
Helpers	4	-	4	7	-	-	-	-	7
Others	-	-	-	-	-	-	-	-	2
Laborers (jerrymen)	5	-	5	8	-	1	1	4.4	8
Trackmen	3	-	3	5	-	-	-	-	6
Drivers	1	-	1	2	3	-	3	13.0	6
Pumpers	1	-	1	2	-	-	-	-	3
Bratticemen	1	-	1	2	-	-	-	-	2
Drillers	-	-	-	-	-	-	-	-	1
Cagers	-	-	-	-	-	-	-	-	1
Engineers (hoisting)	-	1	1	2	-	-	-	-	1
Shotfirers	-	-	-	-	-	-	-	-	1
Electricians	-	-	-	-	-	-	-	-	1
Couplers	-	-	-	-	1	-	1	4.4	1
Miscellaneous	-	-	-	-	-	3/ 1	1	4.4	5
Surface:									
Car droppers	2	-	2	3	-	-	-	-	4
Laborers	-	-	-	-	-	-	-	-	1
Total	50	10	60	100	13	10	23	100	173
Percentage	83	17	100		56.5	43.5	100		

3/ Night watchman entered temporarily abandoned mine to start pumps. Fell to sump while ascending ladder.

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TABLE 6. - Fatalities at stripping or open-cut mines of Indiana, calendar years 1934-38, by causes

	1934	1935	1936	1937	1938	Total	Percent of total
Cause:							
Automobile skidding on ice or snow	-	1	-	-	-	1	6.75
Electricity	1	1	-	-	1	3	20.00
Explosives	-	-	1	-	-	1	6.75
Ignition of gasoline	1	-	-	-	-	1	6.75
Machinery	-	-	-	2	3	5	33.00
Railroad cars	1	1	1	-	-	3	20.00
Rock falling from high wall	1	-	-	-	-	1	6.75
Total	4	3	2	2	4	15	100.00
Occupation:							
Boilermaker	-	-	1	-	-	1	6.75
Car dropper	1	-	-	-	-	1	6.75
Driller and shotfirer	1	1	1	-	1	4	26.50
Laborer	1	-	-	-	1	2	13.00
Night watchman	1	-	-	-	-	1	6.75
Pitman	-	-	-	1	-	1	6.75
Pumper	-	1	-	-	-	1	6.75
Repairman	-	-	-	1	-	1	6.75
Oiler	-	-	-	-	1	1	6.75
Blacksmith	-	-	-	-	1	1	6.75
Superintendent	-	1	-	-	-	1	6.75
Total	4	3	2	2	4	15	100.00

Falls of roof and coal continue as the most frequent cause of fatalities at all underground mines, more especially at the smaller mines; 37 percent of th deaths during 1934 (table 4), 63 percent in 1935, 40 percent in 1936, 42 percent in 1937, and 61 percent in 1938 resulted from falls. Seventeen of 28 fatalities (61 percent) among members of cutting and loading-machine crews during the perio covered by this paper were due to falls of roof and coal. The conditions contributing to many of these fatalities were similar to those in mechanized mines where the officials as well as the workmen chose to take chances although they were fully aware that the roof was dangerous or at least doubtful; as a result, a relatively large number of deaths have occurred at the working face while the machines were operating.

Next to deaths from falls of roof and coal, those due to explosions were most frequent during the 5-year period 1934-38. Of 26 fatalities from this cau 20 occurred in one explosion and 2 in a second explosion during 1937. Of all fatalities at underground mines, only 5 percent in 1934, 3 percent in 1935, and percent in 1936 were due to explosions. This cause was responsible for 37 perc of all deaths at underground mines during 1937. There were no deaths from explosions in 1938.

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Haulage (mine cars and locomotives) caused 21 percent of all deaths at underground mines during 1934, 14 percent in 1935, 21 percent in 1936, 9 percent in 1937, and 22 percent in 1938.

Fatalities in shafts, including persons falling down shafts, cages falling on workmen in the sump, and cars falling on cages in the shaft, took precedence over deaths from electricity, explosives, machinery, and less important causes of accidents. The relatively high death rate from shaft accidents at small mines has already been mentioned in this paper. Of 10 fatalities in shafts during the 5-year period, 8 occurred at wagon mines, again emphasizing the extra hazard of this type of coal producer.

Electrical accidents were fifth in frequency, having caused 21 percent of all deaths in 1934, 9 percent in 1936, and 2 percent in 1937; no deaths from this cause were reported for underground mines during 1935 and 1938. Of the 8 deaths due to electricity during the 5-year period, 4 occurred at the large mines during 1934. No fatalities from electricity occurred at the small mines during the 5-year period; this is to be expected, since the small mines employ little or no electrical power.

Explosives, usually a prolific cause of fatalities at underground mines in Indiana, caused but seven deaths during 1934-38. Four of these occurred at the small mines during 1936. There were no deaths from explosives during 1934 and 1937. Although the number of deaths from explosives (approximately 4 percent) in underground coal mines of Indiana during the 5-year period compares favorably with the national average for fatalities from this cause, this record is no criterion that future records also will be favorable, as many of the blasting practices followed even at the larger mines are extremely hazardous. Black powder is still being used, and in many instances permissible explosives are fired in a nonpermissible manner, such as firing with fuse and cap, with combustible stemming or no stemming, firing 10 to 20 blasts simultaneously with a nonpermissible blasting device, adobe blasting, and failure to test for explosive gas before and after firing; and instances have been reported of shots fired in the presence of an accumulation of explosive gas.

Machinery caused three deaths during the 5-year period, one each year during 1936-38; two of these occurred at large mines and one at a small mine.

Suffocation caused two fatalities, both at temporarily abandoned small mines. As usually happens, other persons were overcome while attempting to rescue the victims. It is reported that in each instance several persons wearing gas masks were overcome while recovering the bodies, but fortunately these men revived when removed to fresh air.

Of the five fatalities on the surface at underground mines during 1934-38, two were caused by railroad cars, one by mine supply cars, and one each by machinery and fall of a loading boom under a tipple. The death from machinery occurred at a small mine (1934) and the others at the larger mines. The two deaths due to railroad cars occurred at one mine in 1937.

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More miners met death during the 5-year period than any other class of labor (table 5). This is to be expected in hand-loading mines, as a relatively greater number are employed in this occupation. However, approximately 75 per cent of all coal produced at the larger underground mines in Indiana is loaded mechanically, and the term "miner" is not employed in classifying labor in mechanically operated mines. Only workmen actually loading coal in hand-loading mines and owners and part owners of small mines are included in this column. The high death rate to workmen in this classification is due largely to fatalities in small mines in which most of the employees are actually engaged in mining coal, and machine loading is seldom done.

The next most hazardous occupation was that of a timberman. Of the 168 fatalities underground at both large and small mines, 20 were timbermen. All of these occurred at the larger mines - 3 in 1935, 4 in 1936, 10 in 1937, and 3 in 1938. Except for two deaths in an explosion during 1937, most of the fatalities among timbermen were due to falls of roof. This also is to be expected as timbering is undoubtedly one of the most dangerous occupations in coal mining.

Thirteen officials were killed during the period 1934-38. In comparison to the number employed, this record probably is far worse than for any other classification. With the exception of three killed in an explosion, many of the other fatalities, as in the case of timbermen, were due to falls of roof. In most instances the accidents happened when officials were trying to remedy some bad roof condition. The number of deaths among members of cutting-machine and loading-machine crews was exceptionally high during the 5-year period. Twenty-eight fatalities occurred among employees in these classifications. As in the case of timbermen and officials, many of the machine crews were killed by falls. Some of this hazard is due to noise, but much is due to removal of timbers to allow use of the machines.

The occupations of laborers (underground), trackmen, drivers, pumpers, bratticemen, drillers, cagers, engineers (hoisting), electricians, and couplers were less hazardous than the other classifications. During previous years, when blasting from the solid was more or less general in underground coal mines of Indiana, comparatively more shotfirers were killed than any other class of mine workers; only one shotfirer was killed during the period covered by this paper. Four of the five men killed on the surface were car droppers and one was a laborer.

Sullivan County experienced the greatest loss of life during the 5-year period. Of the 173 fatalities at underground mines, 48 occurred in this county. Twenty-nine occurred in Vigo, 21 in Knox, 18 in Gibson, 15 in Vermillion, 12 in Clay, 7 in Parke, 6 each in Greene and Pike, 4 in Martin, 3 in Vanderburgh, and 1 each in DuBoise, Owen, Warren, and Warrick Counties. Much of the high loss of life in Sullivan County was caused by one mine explosion.

At stripping or open-cut mines 5 of 15 fatalities (33 percent) were due to machinery (table 6). Electricity and railroad cars caused three each (20 percent); automobile skidding on ice, explosives, ignition of gasoline,

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and rock falling from high wall, one each. The occupation of driller and shot-firer apparently is the most hazardous at open-cut mines, as four (26.5 percent) of all fatalities at these mines occurred among workmen in this classification. Two laborers were killed and one fatality was reported for each of the following occupations: Boiler maker, car dropper, night watchman, pitman, pumper, repairman, oiler, blacksmith, and superintendent.

Fatalities by counties at open-cut mines were as follows: Pike 6, Clay 3, Gibson 3, and Greene 3.

CONCLUSIONS

That accident prevention in the coal-mining industry of Indiana has not progressed as satisfactorily as might be desired by management and employees is apparent from the unfavorable record of the industry. The high death and injury rates apparently indicate a lack of progressiveness and disinclination to do what is necessary to accomplish results obtained elsewhere through intelligent attack on the problem. In isolated instances good records have been made, but these have been the exception rather than the rule. It has been demonstrated in this and other States that accidents at coal mines can be reduced by study of the circumstances under which accidents occur and by proper application of the necessary procedure indicated by knowledge of the underlying causes. No problem is more important to the industry than that of the waste and inefficiency due to avoidable accidents. The worthwhile objective of eliminating accidents is assured only by the highest degree of understanding of the problem by operators and workmen alike, together with utmost cooperation in keeping in effect the known procedures to accomplish the desired result, namely, the reduction of accidents almost to elimination.

Hazardous practices cannot be followed without disastrous consequences; dangerous practices inevitably result in death and injury to men and damage to property that not only cause much human suffering and misery but also invariably increase the cost of the coal. In addition to the loss through waste and inefficiency, the humanitarian side of the problem demands consideration, as this affects not only the employer and the employee but also the public at large. Failure to adopt a well-thought-out organized safety program directed toward the removal of hazards and the adoption of safe procedure has placed a stigma on the coal-mining industry of Indiana that it can ill afford. The cost of accidents to mine operators adds a heavy burden to an already depressed industry; opportunity for reducing this load is at hand through the organization and adoption of an active safety program on a State-wide scale. Substandard conditions should be corrected and dangerous practices eliminated, especially in regard to inspection and care of mine roof, safe procedure in haulage, and good ventilation and protection against explosive gas. Mine officials should be instructed in accident prevention with emphasis on the danger of gas explosions and proper precautions to prevent them. All mines generating gas should be classed as gassy and worked as such; otherwise fatalities and damage to property from explosions are to be expected. One of the worst bars

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to safeguarding the coal mines of Indiana, not only from explosions but also from other accidents, is the failure to use up-to-date electric cap lamps, which give not only a safer but a much more effective light for mine workers than any other light now available.

Certainly, no further argument than the record presented in this paper should be needed to convince even the most skeptical that the small wagon mine in Indiana should be placed under the jurisdiction of the State Inspection Department and forced to conform to common-sense regulations as to health and safety of operation.

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